



Newsletter

Volume 3, Number 2
March - April 1986

Director's Note

Public education has always been a high priority at IES. The new Public Education Program, based at the Gifford House Visitor and Education Center, is expanding the existing offerings and developing new ones.

Among the latter are the Institute's Ecology Internships, and projects done by some of our first student interns are the subject of several articles in this issue of the IES Newsletter. Local school children are benefiting from our educational offerings, most recently by participating in the maple sugar / ecology activities. Nature enthusiasts of all ages are participating in our ecological excursion series, and the adult education program is offering an expanded curriculum in a new trimester format.

The calendar on the last page of each Newsletter lists our current public education programs. I hope you will take advantage of and enjoy these activities.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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Dry Deposition: Another Threat To Our Forests?

Nearly everyone now has heard of 'acid rain' ... but did you know that pollutant deposition occurs even when it isn't raining? Research under way at the Institute of Ecosystem Studies is focused on learning more about all forms of atmospheric pollution and the subtle effects that these airborne chemical compounds have on forest ecosystems.

It is known that particles and pollutant gases such as sulfur dioxide, nitrogen oxides and ozone can be filtered out of the air by the leaves and branches of plants. This pollution is dry deposition, in contrast to wet deposition which is the delivery of pollutants in rainfall. Dry deposition is much more difficult to measure than is wet deposition, but some evidence suggests that for the eastern United States the two forms are roughly equal in magnitude. The pollutants may be deposited on waxes that cover the plants' leaf surfaces or they may enter the interior of leaves through the stomates, or pores, in the same way as does carbon dioxide during normal plant photosynthesis.

Pollutant deposition by whatever means is of concern to ecologists. Some scientists suspect that deposition of certain air pollutants may accelerate the "leaching" of nutrients from plant leaves. "Leaching" is the washing of plant substances out of leaves and bark -- a process that occurs naturally during rainstorms. However, when plants are exposed to acid rain, ozone, sulfur dioxide or nitrogen oxides, leaching may increase to the point where it becomes detrimental to the plants. While there is some evidence to suggest that this occurs, the case is far from being proven.

Atmospheric pollutants have a variety of sources. Airborne particles include soil, dust and combustion products. Sulfur dioxide is largely a product of coal burning. Nitrogen oxides are mostly generated by the combustion process in automobile engines, power plants and factories. Ozone, a pollutant more common in summer than in winter, is a reaction product often seen in polluted air masses which emanate from large cities.

Assistant Scientist Gary Lovett, a plant ecologist, will be looking at the effects of these atmospheric pollutants on nutrient cycling in the local forest canopy. He is currently setting up an air quality station at the Research Field, a site used since 1983 by John Eaton, manager of laboratory facilities, for monitoring precipitation including acid rain. Because of the site's location, air quality there should be representative of most of rural Dutchess County. Airborne particles, sulfur dioxide and nitric acid vapor will be sampled by pulling air through a filterholder in which specially treated filter papers remove

particles and absorb specific gases. The filters will be collected weekly and chemically analyzed in IES laboratories. Ozone will be measured constantly, using an ozone monitor housed in a small building in the Research Field. Information resulting from the atmospheric sampling will be stored in computers to be used as background data, not only by Dr. Lovett in his related research but also by other IES scientists. Summaries, available to the public, will be published annually.

In a second project, designed to learn more about the effects of air pollution in local forests, Dr. Lovett is establishing a field research site in the forest of the Mary Flagler Cary Arboretum. After constructing a scaffolding which will permit access to the canopy, he will experimentally manipulate branches by exposing them to acid rain solutions or by putting them in plastic bag-like chambers and changing



Gary Lovett examining a filter holder which will trap pollutants for analysis.

the concentrations of pollutant gases. The sugar maple, *Acer saccharum*, and the white pine, *Pinus strobus*, will be Dr. Lovett's first subjects. The project is designed to examine subtle changes in the functioning of the forests ... changes that may become even more significant as they accumulate over a number of years. Data from this study site will be integrated with data from a larger project in which the effects of air pollution on forest nutrient cycling will be investigated at several sites across the U.S.

Dr. Lovett's research is part of a nationwide project sponsored by the

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The Endangered Sugar Maple

by Lori Grant
Education Intern

The 'helicopters' that spiral down in autumn breezes are pairs of samaras that enclose the seeds of the sugar maple tree. The saplings which grow from these seeds eventually become important constituents of hardwood forests in the northeastern United States.

The sugar maple, *Acer saccharum*, has long played an interesting role in the cultural history and ecology of this region. Native Americans depended upon the yearly flow of sap, collecting and boiling it until it crystallized. In solid form this maple sugar was convenient to store and to use in a variety of ways: as a spice; as a staple mixed with cornmeal and animal fat; and, of course, as a dessert. During the early 1800's Quakers promoted maple syrup as an economic and 'medicinal' alternative to sugar, hoping to help abolish the slave trade. Today's commercial maple syrup producers and backyard sugarers rely on the trees as much as their predecessors did (and winters such as this past one, in which the weather turned too warm too quickly, spell economic trouble for some!).

Humans are not the only ones with an interest in the sugar maple forest. The mourning cloak butterfly depends on the trees for food in the early spring; overwintering in the adult form, it hides

beneath bark and emerges during thaws when it can be seen fluttering around trunk scars which run with sap. Tiny aphids satisfy their hunger by sucking the juices of maple leaves; certain species of ants protect these insects to harvest their sweet 'honeydew'. Also, especially in the fall, aphids are eaten by migrating warblers. Year-round residents of the forest include chickadees, jays and woodpeckers; squirrels nibble maple twigs for sap. Deer, black bear, and a variety of mice, shrews, moles and voles find shelter in and among the trees.

The ecological, economic and aesthetic importance of the sugar maple has guaranteed that a watchful scientific eye is kept on the species. Over the years its health has been monitored and studied. Periods of decline in the last two decades have been attributed to drought, but a more recent decline in growth has been noted and scientists are cautious in speculating on its causes. A new set of symptoms has appeared: under drought conditions the whole tree shows signs of dieback simultaneously, while defoliation is now progressing from the crown down. More specific signs of decline are also being reported. Shorter twigs and narrower growth rings mark reduced growth. Trees of the species that

formerly lived to be 200 years old now rarely reach more than 150 years.

The factors which may contribute to these symptoms are difficult to isolate. Among human-caused factors being studied are acid rain and acid cloud-water, dry deposition from motor vehicle exhaust and other sources, an increase in ozone in the atmosphere (see article on page 1), trace metal deposition in the forest canopy and soils, and road salt used on winter highways. In addition, wounds made by insects or people -- for example tap holes from the maple sugaring process -- are vulnerable to bacterial and yeast colonization and fungal pathogens.

The sugar maple is extremely sensitive to changes in its environment. As such, the species can serve as an indicator for conditions which could affect whole ecosystems. It is too early to know whether the present decline of the sugar maple is reversible, and whether similar symptoms are going to show up soon in other species. The more we know about the ecology of sugar maple, however, the greater the likelihood that action can be taken to ensure its survival and continued contribution as a source of food and shelter.

Spring Maple Sugaring

During the early weeks of the spring thaw the IES Education Program invited classes of third, fourth and fifth graders to the Arboretum's sugar bush, to see for themselves the sap-to-syrup process. Over a two-week period, twenty-three local school groups participated in 90-minute programs orchestrated by Ecology Education Intern Lori Grant with Program Specialist Kass Hogan.

The program's objective was to give children an insight into the ecology of the sugar maple forest. The starting point was the IES informational display outside Gifford House, where Ms. Grant invited all the students to be scientists and passed out hand lenses to help with their observations. On the path to the sugar bush the classes stopped to observe the forest at a distance, comparing evergreens with deciduous trees and learning which characteristics distinguish sugar maples.

Back in the woods, trees had been tapped. Maple sap was being collected in both the traditional spile-and-bucket and modern

polyethylene-tubing-and-covered-container methods. As the children were tasting the sap and learning more about the tapping process, suddenly, from her home among the rocks and trees, appeared Robin Wood! Robin, an ageless woodland



Robin Wood and characters in an ecology play.

character, described how Indians and early settlers had collected maple sap, and, inviting the children to be actors in a play, demonstrated natural and human-

influenced changes in the forest community.

The programs ended at the Gifford House barn, where sap was being boiled in an evaporator and where IES Volunteer Carol Perkins served corn muffins and maple syrup, home-made maple candy ... and pickles ... to the young scientists.

Bill Road
Poughkeepsie, New York 12570
March 14, 1986

Dear Ms. Grant,
Hi again! Thank you for a fun time! What I liked best about our trip was when we were hiking, meeting Robin Wood, seeing maple sugar, and learning about maple syrup.
When ever you have maple syrup, you never think about where it comes from but I think people should stop to think about it. I liked everything about the trip!

Yours truly,
Myra Pajino

JILL CADWALLADER

Ecology Internships

When Dr. Alan Berkowitz arrived at the Institute last summer, one of his top priorities as head of education was to develop an Ecology Internship Program in which talented individuals could put their educational background to practical use while learning firsthand about ecosystem research. Internships in Education, Communications and Research Demonstration were established, with interns in each area working alongside education staff members on projects designed to involve the public in the purposes, methods and results of ecological research. Three interns have been accepted for twelve-week internships so far in 1986, in the Communications and Education areas.

Groundwater was a subject which interested Faye Rapoport, a masters degree student specializing in environmental communications at the State University of New York School of Environmental Science and Forestry. As an ecology communications intern, she was challenged by the concept of introducing the subject of groundwater from an ecosystems point of view, communicating current knowledge of this very topical subject in an interesting, informative ... and innovative ... way. The result, an illustrated brochure which highlights Dutchess County's groundwater situation, will be sent to Arboretum members later this year, and will be available to the general



Faye Rapoport and Lori Grant.

public at the IES Visitor and Education Center and through various local and state agencies.

Lori Grant, a graduate of the University of Wisconsin at Madison, is pursuing a career in environmental education and in February became the Institute's first ecology education intern. Her primary responsibility was to develop the curriculum for this year's maple sugaring program for local school children (see article on page 2), and then to lead the groups on their explorations of the Arboretum's maple forest community. Working with Program Specialist Kass Hogan, she also was involved in preparing materials for upcoming educational programs in the Millbrook schools. Her IES internship led to a position as education assistant for Hudson River

Sloop Clearwater, Inc., and this spring she will be providing ecological instruction on board the **Voyager**.

Indoor displays highlighting IES programs have been high on the Institute's list of projects for an ecology communications intern, and Cornell University graduate Collin Harty (below) began working on the first of these exhibits late in March. He is designing a display for the public area of the Gifford House Visitor and Education Center, combining specifics of IES research with the concepts and methods of ecosystem science.



Internships are offered year-round, and those interested in learning more about the program are invited to contact the IES Education Office.

Bluebirds Return to New York and to the Arboretum by Faye Rapoport Communications Intern

On February 26, 1986, an enthusiastic group from the Ralph T. Waterman Bird Club braved freezing temperatures to take part in an ornithology field trip at the Arboretum. The club members are no strangers to the area, having had a bluebird preservation project on the Arboretum grounds for the past 11 years.

The eastern bluebird, *Sialia sialis*, has long been one of America's favorite birds. Several factors, however, led to a 90% decline in the population during the first half of the twentieth century. According to Florence Germond, who is in charge of the project at the Arboretum, the bluebird population suffered when bird species such as the English sparrow and the starling were introduced to North America in the late 1800s. These more dominant species took over the bluebird's nesting spots. Nesting space also was lost when increases in agriculture led to the destruction of wild habitats: dead trees were cut away, and eventually even wooden fence posts, a favorite bluebird nesting spot, were replaced by metal fencing.

In 1962, following the example of

concerned citizens in some western states, the Waterman Bird Club decided to provide nesting boxes for bluebirds to replace the lost nests and prevent the population from disappearing altogether. Over the past 24 years the club has built what they call "bluebird trails" -- stretches of land where boxes are placed -- throughout central Dutchess County. In 1975 they set up a trail at the Mary Flagler Cary Arboretum, where over twenty nesting boxes can now be seen on the property.

Members of the club clean the boxes each spring, then keep weekly records of eggs laid and nestling survival rates. In 1984, 21 bluebird nestings were recorded, with 86 eggs laid and 53 young birds fledged. The following year promised to be even more successful, with 35 nestings and 171 eggs laid, but the eggs and young fell prey to heightened raccoon predation and only 52 young birds were fledged. With PVC pipe recently installed to discourage these climbing predators, Germond is hopeful that the raccoon problem will not recur in 1986.

The chilly group of ornithologists reported several bluebird sightings during their

February visit, proof that the nesting program has been a real success. Has all the work been worth it? One woman smiled at me when I asked the question. "After all," she said, "it's our state bird!"

Deposition from page 1

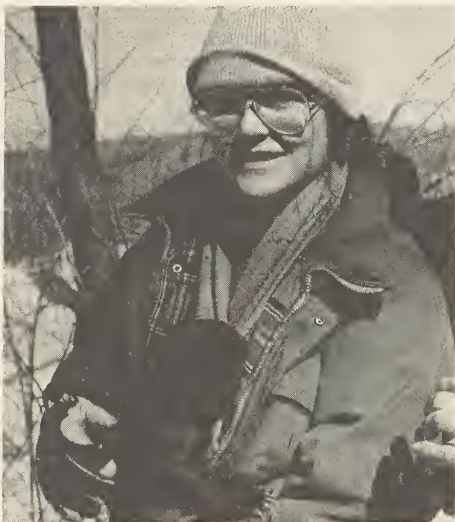
Electric Power Research Institute, a consortium set up to coordinate research on all aspects of electric power. The dues paid by member power companies fund the research projects. The air quality station will be supported by funds from the Institute of Ecosystem Studies.

* * * * *

Gary M. Lovett arrived at the Institute last fall, after completing post-doctoral work at the Oak Ridge National Laboratory in Tennessee and spending two years as a research associate at the University of Tennessee. Results of some of his recent research appeared in the January 10th, 1986 issue of *SCIENCE*: "Atmospheric Deposition and Canopy Interactions of Major Ions in a Forest", by S.E. Lindberg, G.M. Lovett, D.D. Richter and D.W. Johnson.

Bear Watch

On March 8th, 18 warmly dressed wildlife enthusiasts participated in the first IES bear watch, an ecological excursion coordinated by the Public Education Program. The group was led by Ray Winchcombe, manager of IES Field Research Facilities, Joe Warner, IES administrator, and Gary Alt, wildlife biologist with the Pennsylvania Game Commission.



LINDA DOWNEY

Karen Kays and "Roscoe".

Participants spent the day in the Pocono Mountains of Pennsylvania learning about the ecology of the black bear as Mr. Alt replaced the radio tracking collar on a hibernating female, 'Lucky', and weighed her single five-week old, five-and-a-half pound cub 'Roscoe'. While Lucky was sedated Mr. Alt collected milk and blood samples; during this period group members were able to hold Roscoe, keeping him warm inside their coats until he could be reunited with his mother.

Spring Calendar

COURSES

Two end-of-semester courses are being offered as part of the spring adult education program. These are Botany Certificate Courses but have no prerequisites and are open to all those who wish to extend their knowledge of local plants:

Edible Wild Plants Workshop.

Instructor: E. Barrie Kavasch
Explore the spring flora for valuable edible, beverage and seasoning plants and plant parts. (May 31st & June 7th, 9a.m. - noon)

Field Botany: Local Flowering Plants.

Instructor: Dr. Mark McDonnell
Become familiar with characteristics of important families and genera of flowering plants; learn basic field techniques while studying the flora of forests, fields and swamps. (June 7th & 21st, 9a.m. - 3p.m., and June 9th, 7-9p.m.)

ECOLOGICAL EXCURSIONS

One of several IES excursions planned for fall will go to Bermuda for ISLAND AND MARINE ECOLOGY. Participants will stay at the Bermuda Biological Station, their base of operations for field trips, snorkeling expeditions and lectures on local ecology. The one-week excursion will take place late in October; exact dates will be set soon. As early registration is necessary, interested persons are invited to call Jill Cadwallader at (914) 677-5359.

SUNDAY PROGRAMS

Public programs are offered on the first and third Sundays of each month. All programs run from 2:00 - 4:00 p.m. and start at the Gifford House unless otherwise noted. They are open to everyone at no cost.

Tentative schedule (please call the number below to confirm the day's topic):

May 4th, Plant lore and legend,

E. Wolfson

May 18th, Introduction to and observation

of kestrels, M. Fargione

June 1st, Local edible plants, K. Kays

June 15th, Exploring human and natural influences on forest change,

J. Glitzenstein

July 6th, A field guide to plant defenses, C. Jones

SCIENTIFIC SEMINARS

The Institute's weekly program of scientific seminars features presentations by visiting scientists or Institute staff. All seminars take place in the Plant Science Building on Fridays at 3:30 p.m. Admission is free. For a schedule, contact Julie Morgan at (914) 677-5343.

ARBORETUM HOURS

Monday through Saturday, 9 a.m. to 4 p.m.; Sunday, 1-4 p.m. The Gift and Plant Shops are open Tuesday through Saturday 11 a.m. to 4 p.m.; Sunday 1-4 p.m. Closed on public holidays. All visitors must obtain a free permit at the Gifford House for access to the Arboretum. Roads closed to vehicles when snow covered.

MEMBERSHIP

Take out a membership in the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, six issues of the IES Newsletter each year, free subscription to *Garden* (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at the New York Botanical Garden in the Bronx. Individual membership is \$25; family membership is \$35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

Note: Your membership contribution to the Mary Flagler Cary Arboretum is eligible for the IBM Matching Grants Program for Hospitals and the Arts.

For more information, call (914) 677-5359 weekdays from 8:30-4:30

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